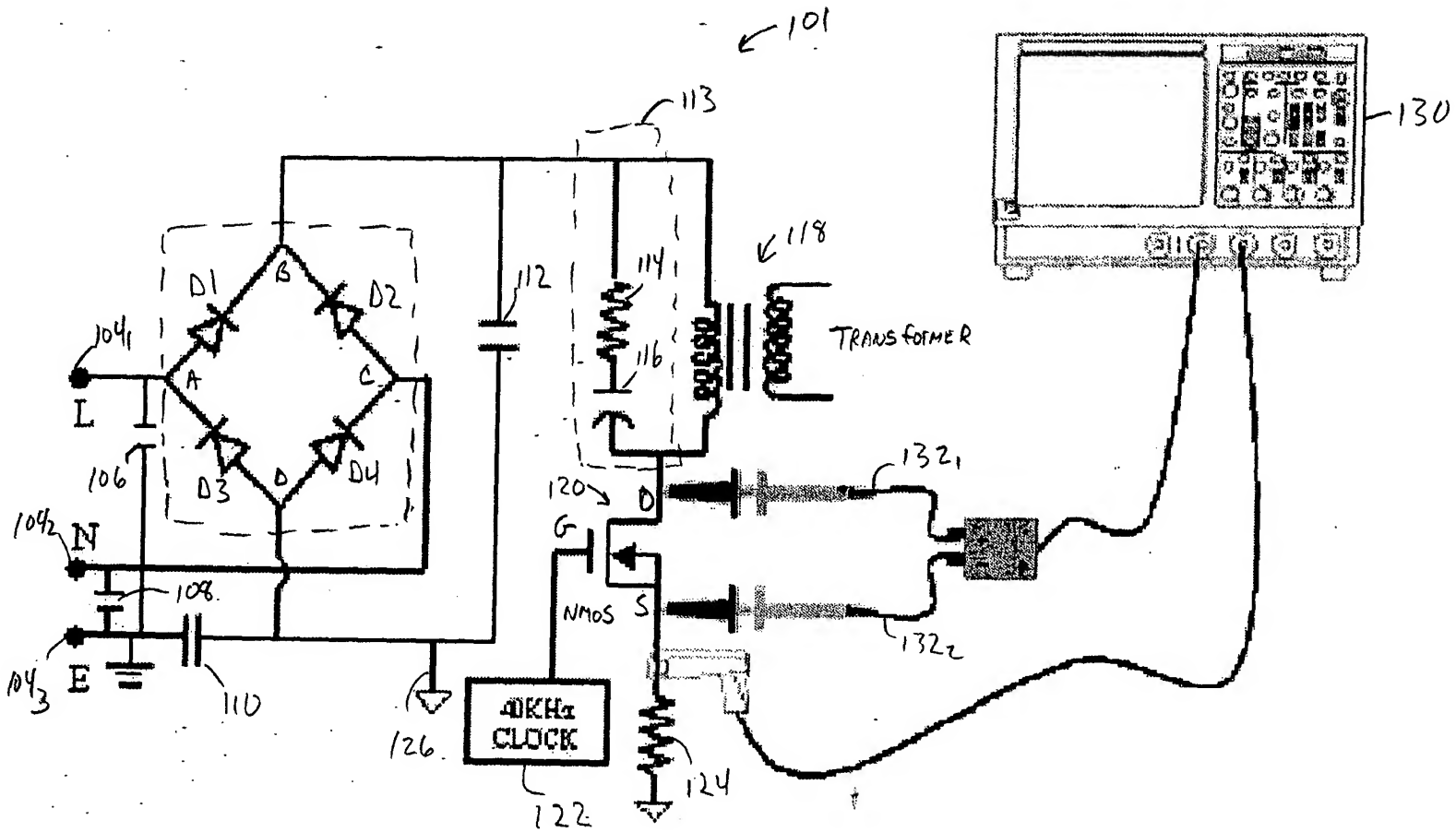

101
113
130
118
112
114
116
TRANSFORMER
D1
D2
D3
D4
A
B
C
D
104₁
L
106
104₂
N
108
104₃
E
110
120
G
D
S
NMOS
132₁
132₂
40KHz
CLOCK
122
126
124

FIG. 1

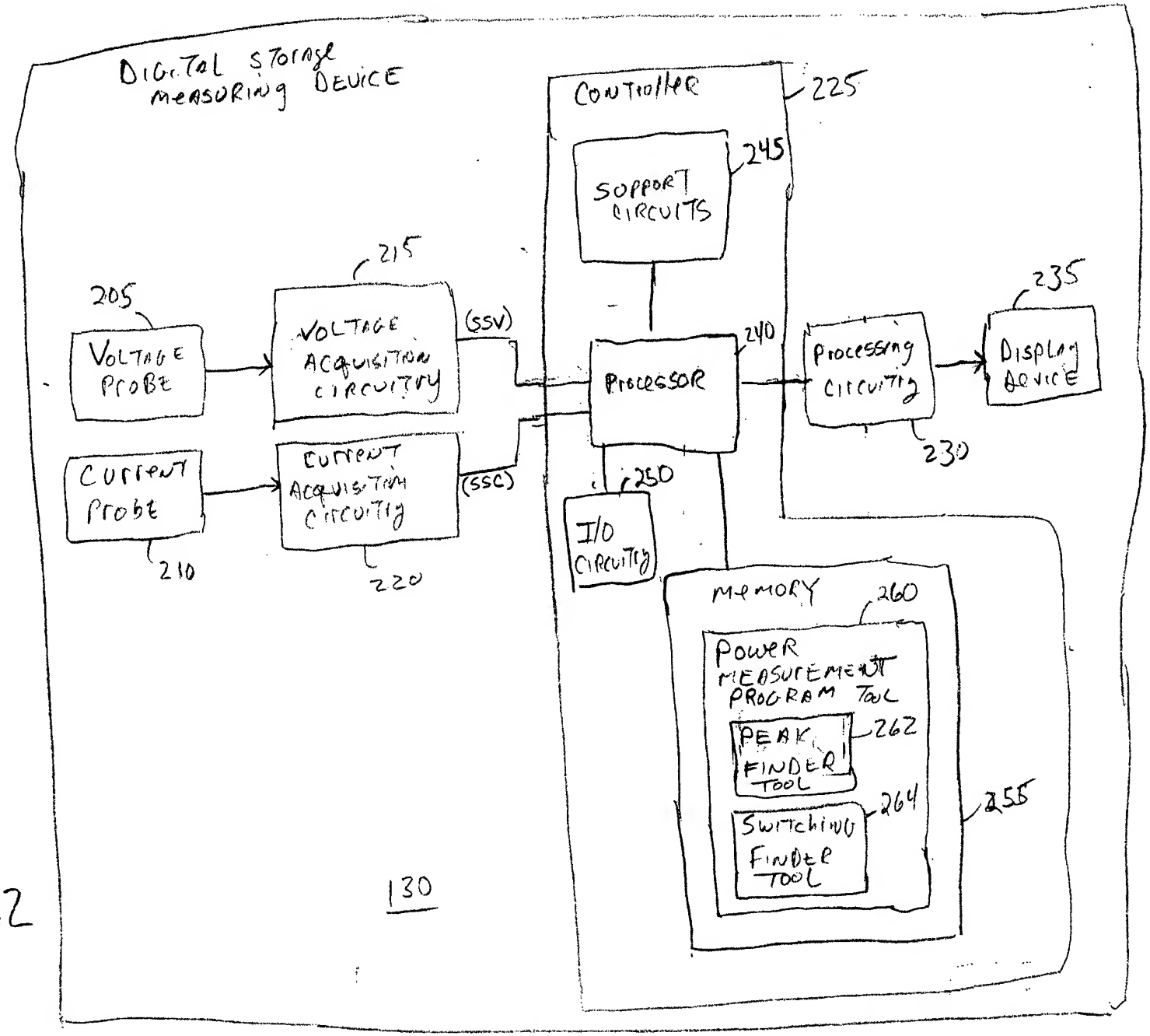
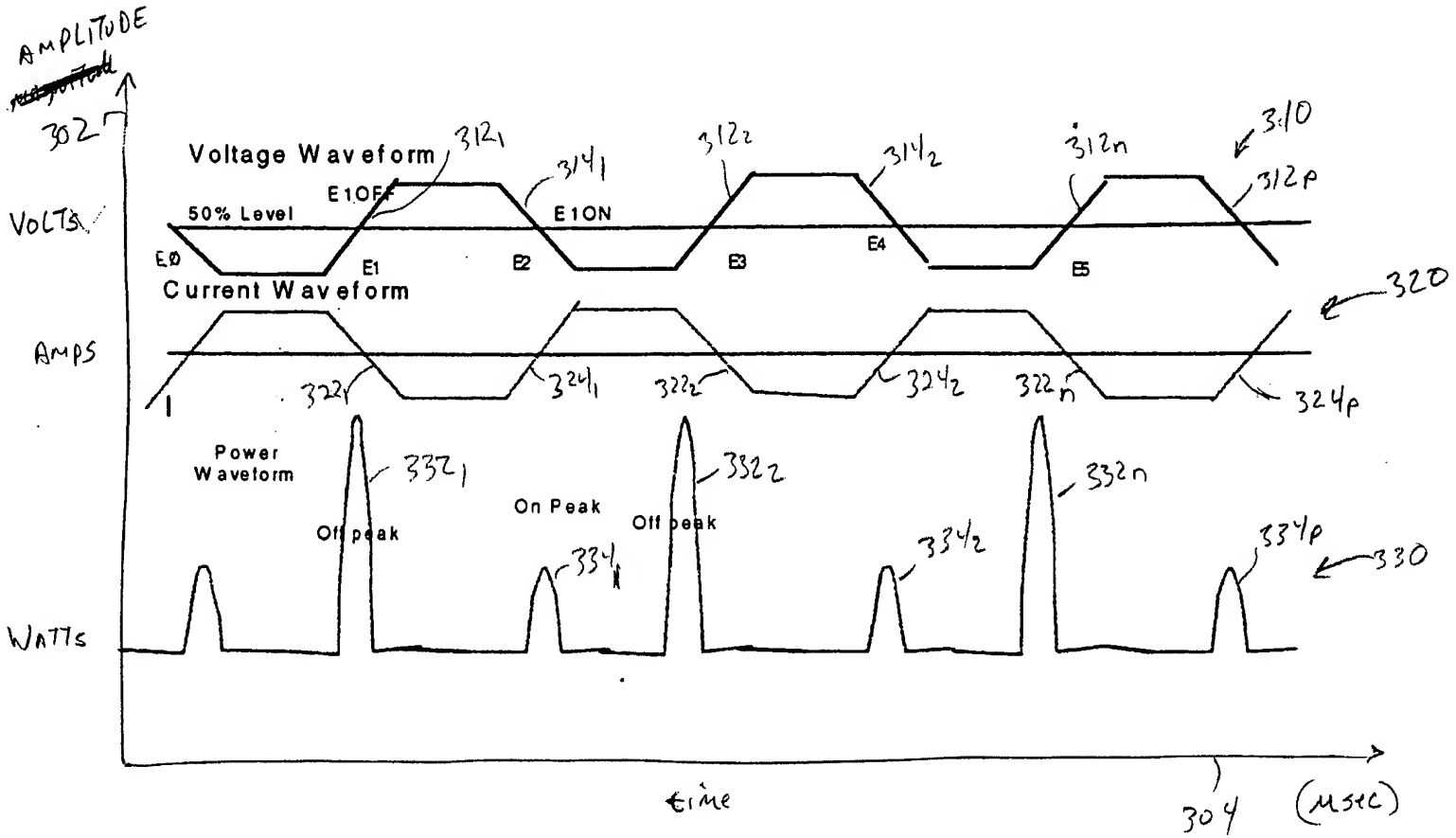

DIGITAL STORAGE MEASURING DEVICE
CONTROLLER
225
SUPPORT CIRCUITS
245
215
205
VOLTAGE PROBE
VOLTAGE ACQUISITION CIRCUITRY
(SSV)
PROCESSOR
240
PROCESSING CIRCUITRY
235
DISPLAY DEVICE
230
CURRENT PROBE
210
CURRENT ACQUISITION CIRCUITRY
(SSC)
220
250
I/O CIRCUITRY
MEMORY
260
POWER MEASUREMENT PROGRAM TOOL
PEAK FINDER TOOL
262
SWITCHING FINDER TOOL
264
255
130

FIG. 2


AMPLITUDE
302
VOLTS
Voltage Waveform
312₁
314₁
312₂
314₂
312n
310
312p
50% Level
E1OFF
E1ON
E0
E1
E2
E3
E4
E5
Current Waveform
320
AMPS
322₁
324₁
322₂
324₂
322n
324p
Power Waveform
332₁
332₂
332n
Off peak
On Peak
Off peak
334₁
334₂
334p
330
WATTS
time
304
(msec)

300

300

FIG. 3

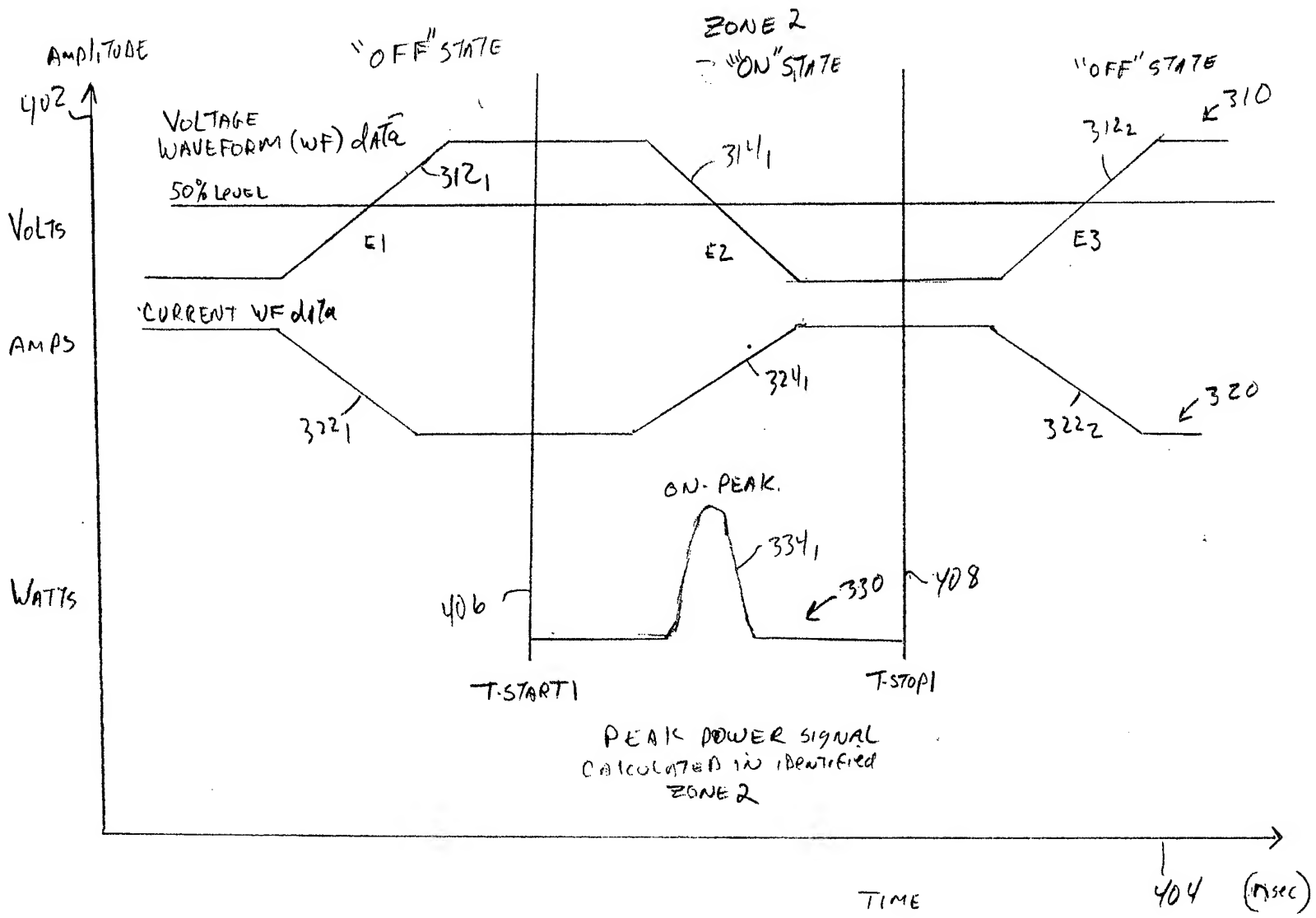
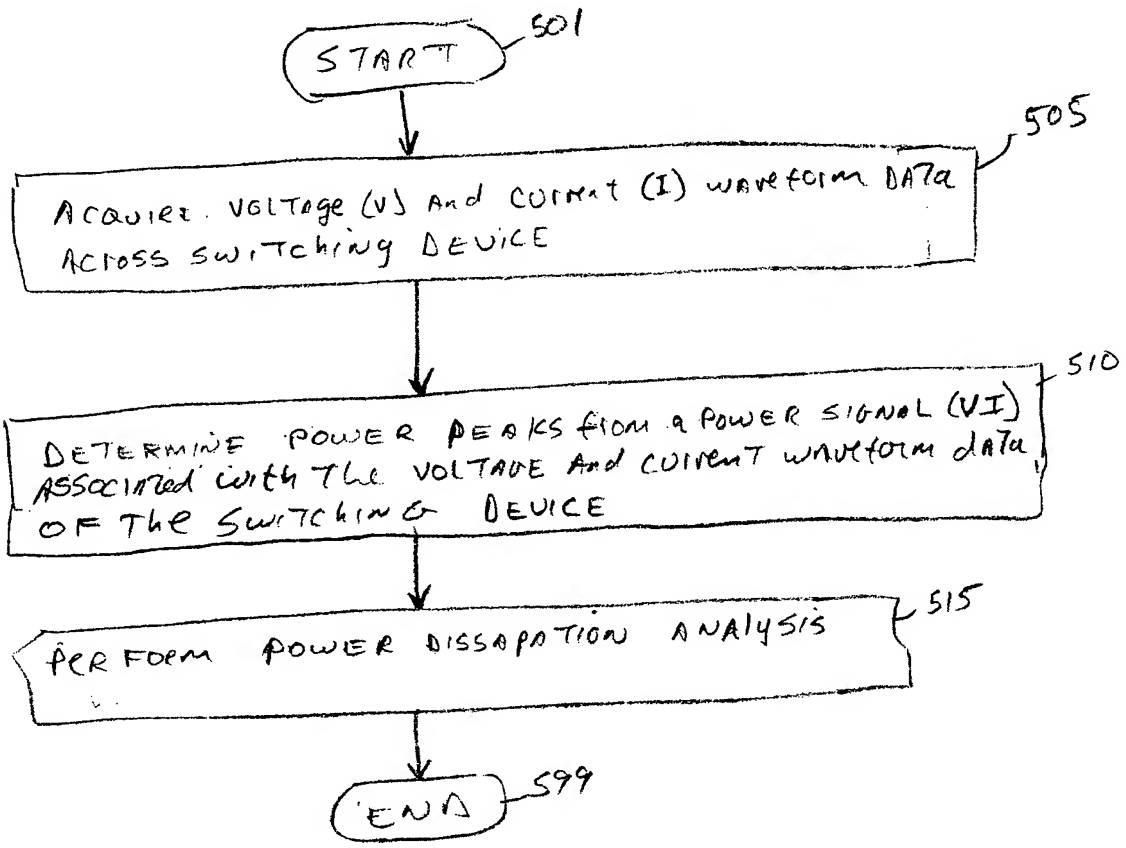

AMPLITUDE
402
VOLTS
AMPS
WATTS
"OFF" STATE
ZONE 2
"ON" STATE
"OFF" STATE
VOLTAGE WAVEFORM (WF) data
50% LEVEL
312₁
314₁
312₂
310
E1
E2
E3
CURRENT WF data
324₁
322₁
322₂
320
ON-PEAK
334₁
330
406
408
T-START1
T-STOP1
PEAK POWER SIGNAL CALCULATED IN IDENTIFIED ZONE 2
404
TIME
(msec)

FIG. 4


START
501
ACQUIRE VOLTAGE (V) AND CURRENT (I) WAVEFORM DATA ACROSS SWITCHING DEVICE
505
DETERMINE POWER PEAKS FROM A POWER SIGNAL (VI) ASSOCIATED WITH THE VOLTAGE AND CURRENT WAVEFORM DATA OF THE SWITCHING DEVICE
510
PERFORM POWER DISSIPATION ANALYSIS
515
END
599

500

FIG. 5

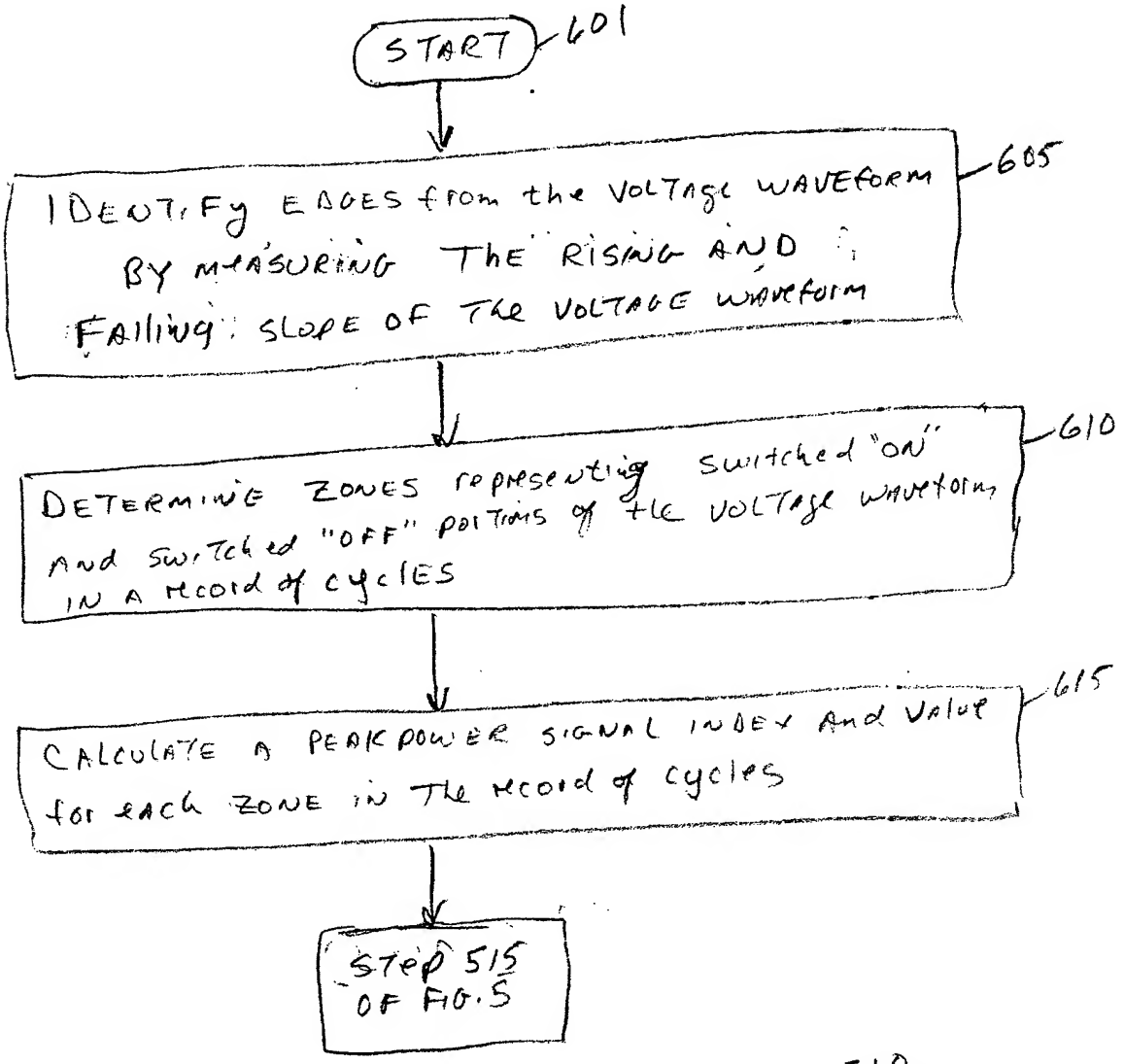
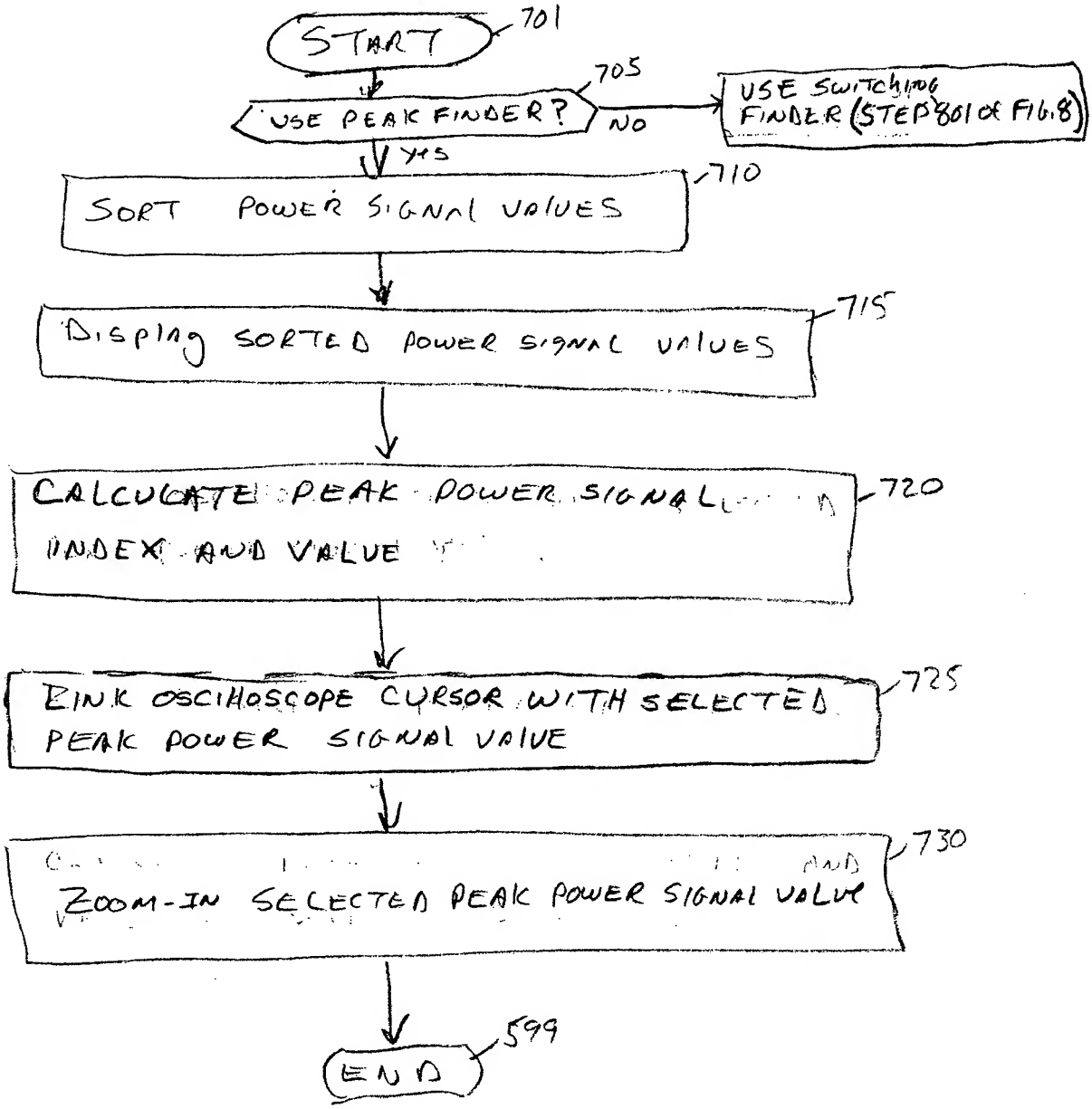
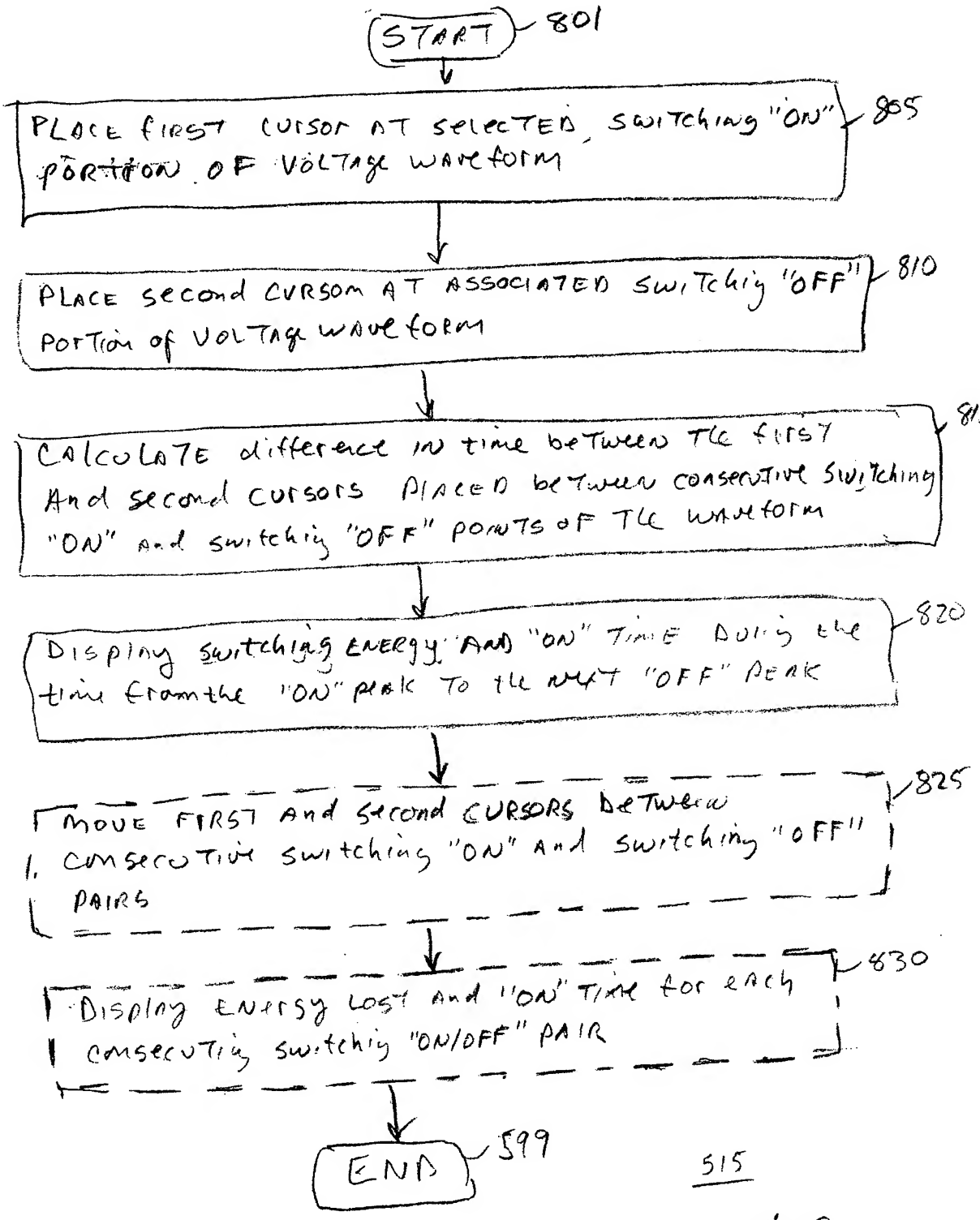

START
601
IDENTIFY EDGES from the VOLTAGE WAVEFORM BY MEASURING THE RISING AND FALLING SLOPE OF THE VOLTAGE WAVEFORM
605
DETERMINE ZONES representing switched "ON" AND switched "OFF" PORTIONS of the VOLTAGE WAVEFORM IN A record of cycles
610
CALCULATE A PEAK POWER SIGNAL INDEX AND VALUE for each ZONE IN THE record of cycles
615
STEP 515 OF FIG. 5
510

FIG. 6


START
701
USE PEAK FINDER?
705
NO
USE SWITCHING FINDER (STEP 801 OF FIG. 8)
YES
SORT POWER SIGNAL VALUES
710
DISPLAY SORTED POWER SIGNAL VALUES
715
CALCULATE PEAK POWER SIGNAL INDEX AND VALUE
720
LINK OSCILLOSCOPE CURSOR WITH SELECTED PEAK POWER SIGNAL VALUE
725
ZOOM-IN SELECTED PEAK POWER SIGNAL VALUE
730
END
599

515

FIG. 7


START
801
PLACE FIRST CURSOR AT SELECTED, SWITCHING "ON" PORTION OF VOLTAGE WAVEFORM
805
PLACE second CURSOR AT ASSOCIATED SWITCHING "OFF" PORTION of VOLTAGE WAVEFORM
810
CALCULATE difference IN time BETWEEN THE FIRST And second CURSORS PLACED BETWEEN CONSECUTIVE SWITCHING "ON" And switching "OFF" POINTS OF THE WAVEFORM
815
DISPLAY SWITCHING ENERGY And "ON" TIME DURING THE time from the "ON" PEAK TO THE NEXT "OFF" PEAK
820
MOVE FIRST And second CURSORS BETWEEN 1. CONSECUTIVE switching "ON" And switching "OFF" PAIRS
825
DISPLAY ENERGY LOST And "ON" TIME for EACH CONSECUTIVE switching "ON/OFF" PAIR
830
END
599

515

Fig. 8